

Ratio
Study
Summary

September 15

2015

Arkansas Assessment Coordination Department
1614 West Third Street
Little Rock, AR 72201

1. STUDY METHODOLOGY

1.1 Data Preparation

In accordance with ACD rules, counties and their contractors provided ACD with a file of all real property parcels for 2015. The files, provided in Excel format, contained relevant property characteristics, valuation, and sales data as called for in Rule 4.04.1b. We converted these files to a common SPSS format for analysis, checked for duplicate parcels, and removed exempt and other properties outside the scope of the study. Relevant property types were classified as residential improved (RI), commercial improved (CI), or vacant land (VA).

Based on deed types and validation codes we identified sales usable for ratio analysis. We considered only warranty and special warranty deeds and excluded all validation codes enumerated in ACD rules other than VS, VA, AP, or UV. In accordance with ACD rules, we eliminated the lowest 10% of properties in their class (RI, CI, or VA), any sales involving new construction, mobile home properties, and any commercial/industrial properties that constituted more than 5% of the total value of commercial/industrial properties in the county. We combined appraised values for multiple parcel sales. We also performed a special analysis of unverified (UV) sales in which we compared the distribution of ratios for these sales with those of validated sales. We removed extreme ratios for UV sales that both (a) lied outside the distribution of validated sales and (b) fell below 0.25 or above 2.00. Section 1.3 below describes general outlier analysis.

Per ACD rules, one year of residential and vacant land sales and two years of commercial sales were used for analysis in counties with 50,000 or more real property parcels. For other counties, two years of residential and vacant sales and three years of commercial sales were used for analysis.

At the conclusion of exploratory data analysis and sales screening we saved a data file containing both sold and unsold parcels for use in subsequent analyses.

1.2 Time Trend Analysis

Sales were analyzed and adjusted for statistically significant changes in price levels over the relevant study period. Using the sales ratio trend method we conducted a separate analysis for each property type in each county with adequate sales¹. In each case we began by plotting sale-to-assessment ratios (SARs) against time and temporarily filtering outlier SARs. We studied

¹ For a more detailed discussion of the sales ratio trend method of time adjustment, see Robert Gloudemans, *Mass Appraisal or Real Property* (IAAO, 1999), pages 265-268 or Robert Gloudemans and Richard Almy, *Fundamentals for Mass Appraisal* (IAAO, 2011), pages 151-155.

plots to determine whether trends could be approximated with a straight line. If not, “splines” (multiple straight lines) were defined to approximate the indicated pattern.

Regression analysis was used to test for statistical significance and quantify significant trends. The dependent variable in these analyses was the logarithm of SARs and the independent variable was Months (e.g., 1-24 for two years of data) or segments thereof. For example, if the market appeared to be flat in the first 15 months and then increase over the remaining 9 months, we would test two splines: Months1 (1-15) and Months2 (0-9). For a sale occurring in month 20, Months1 would be coded as 15 and Months2 as 5, since the sale price would reflect any price changes over all 20 months. If the sale occurred in month 10, Months1 would be coded as 10 and Months2 as 0. The logarithm of SAR was used in order to determine percentage changes. If a time trend was found, sales prices were adjusted to the end of the study period at the indicated rate or rates.

1.3 Outlier Analysis

With sales adjusted for time as necessary, we analyzed ratios for outliers and removed those that would compromise the validity of ratio statistics. The analysis began by plotting the distribution of sales ratios on both raw and logarithmic format. We tagged any ratios that were more than 1.5 times the inter-quartile range (IQR) below the 25th percentile or above the 75th percentile. However, in no case did we trim ratios between 0.60 and 1.40. The resulting trim points and distribution of tagged and untagged sales was analyzed and trim points adjusted as necessary to make logical sense, that is, to ensure that obvious outliers were excluded but that ratios constituting a smooth progression were retained.

A guiding principle in the outlier analysis was, where possible, to remove no more than 5% of ratios for a given property type in a given county. However, when samples were small or ratios exhibited wide dispersion, this general rule was relaxed with the caveats that (a) where possible, no more than 10% of ratios in a class were removed and (b) where possible, no more than 5.5% of all ratios were removed.

1.4 Ratio Analysis

Once outliers were removed, we calculated key ratio statistics for each of the three property types. For each property type, we calculated and reported the number of sales, median ratio, 95% confidence interval for the median, coefficient of dispersion (COD), and price-related differential (PRD). These statistics were also reported by market area, city, and school district.

Separately, using additional sample data provided, we calculated median ratios, 95% confidence interval for the median, and coefficient of dispersion (COD) for agricultural and business personal property; median ratios for non-business personal property (autos) were also incorporated into the study.

Using total assessed values calculated for each of the three major study classes, we divided assessed values by median ratios to obtain estimated total market values for each class. Similarly, using abstract data provided to ACD by counties or their contractors, we divided assessed value for agricultural, business personal and non-business personal property by their respective medians (usually 20%) to obtain estimated market values for each of these property classes. Finally, we summed assessed values and estimated market values for the six property types and divided aggregate assessed value by aggregate market value to obtain the estimated overall assessment ratio. According to ACD standards this ratio must be between 18% and 22%. In addition, the 95% confidence interval for each of the three major classes must overlap 0.18 to 0.22, as must the 95% confidence interval for residential property and vacant land in each market area. CODs must also comply with requirements set out in ACD rules.

1.5 Sold Versus Unsold Parcels

ACD's rules require the agency to "vigilantly monitor whether counties are appraising unsold properties in the same manner as sold properties." To this end we compared median and average value changes for each of the three property classes and highlighted cases where differences exceeded 10%. We also used the Mann-Whitney test to determine the statistical reliability of observed differences. These analyses were conducted after removing the lowest 5% and highest 5% of value changes for both sold and unsold properties in each of the three classes. In order to ensure that we were only analyzing the true percent increase or decrease between the previous to current appraised values, all parcels containing more than 5% of new construction were also removed from the analysis. Indicated cut points were further adjusted if required to remove unusually large changes.

If initial analysis indicated statistically significant changes of more than 10% based on either the median or mean ratio, we conducted supplemental analyses at the market area and/or neighborhood level. In some cases we compared the percentage of sold and unsold properties for which values were changed and the percentage for which changes exceeded meaningful thresholds, say 10% or 20%. Based on these comparisons we highlighted instances of systematic differences in value changes between sold and unsold parcels.

2. SUMMARY OF FINDINGS

Attachment 1 summarizes results for the 19 counties included in the 2015 study. In all cases the level of assessment complies with ACD rules. In all cases except three (see footnotes on Attachment 1), appraisal uniformity (COD) complies with ACD rules.

Statistically significant time trends were found in four of the nineteen counties.

As the final column to the table indicates, in all cases the “Sold versus Unsold Parcels” test complies with ACD rules.

Attachment 2 shows the percentage of sales assigned valid and invalid verification codes in each county, the percentage coded “UV” or (less frequently) left blank, as well as the percentage assigned an undefined code (codes not on the approved list of validation codes as listed in Rule 4.04.1c3a&b).

3. RELEVANT ISSUES

Since multiple sales of the same property are now being used in the analysis, the “sale type” field was added to the Extract report to aid in the analysis of these sales. Many counties are coding this field incorrectly or leaving this field blank. It is extremely important that counties use this field and code these sales correctly to ensure that the sales are being analyzed correctly. For example, if a sale occurs on a vacant property and then improvements are built on that property, the “sale type” still needs to be coded as ‘vacant’ so that during the analysis only the appraised land value is compared to the sale price. If the “sale type” field is left blank or coded as ‘improved’, the analysis will compare the total appraised value (which includes improvements) to the vacant land sales price, which will artificially inflate the sales ratio for the property. If enough of these sales are coded incorrectly, it could have a detrimental effect on the overall ratio results causing a county to fail the ratio study and fall out of compliance.

Another area in which improper coding has been detected is occurring with sales that involve multiple parcels. Several coding errors have been discovered on these types of sales on both the “sale type” and “sales validation code” fields. If a multi-parcel sale occurs involving both improved and vacant parcels, then all parcels involved in the sale should be coded as ‘improved’ in the “sale type”, even though some of the parcels may have a vacant property type code. For example, if a sale consists of a house and two vacant lots, the “sale type” should be coded as ‘improved’ on all 3 parcels. The “sale type” strictly refers to type of sale (improved or vacant), not the individual property types. The second area where coding errors have been discovered concerning multi-parcel sales are in the “sales validation code” field, both for valid and invalid sales.

- For valid sales, the “sales validation code” for the primary parcel (which should be the most predominate parcel, or better put – usually the parcel with the highest value) should be coded as ‘VA’ (primary parcel of a group of parcels that have sold) and the remaining parcels should be coded as ‘AP’ (additional parcels that are linked to the primary parcel). All parcels in a multi-parcel sale should have the same ownership transfer record (sale price, book, page, grantee, grantor, etc.), but for analysis purposes only one of these parcels should remain in the sample, otherwise you will be analyzing the same sale multiple times. The SPSS syntax takes care of this in the following manner: The parcel coded with the ‘VA’ sales validation code is tagged as the primary parcel, if none of the parcels are coded ‘VA’ then the syntax will tag the parcel with the highest total value as the primary parcel. The appraised value fields (current and previous) on the primary parcel are replaced with the aggregated values of all parcels contained in the multi-parcel sale to determine the total appraised value for all parcels involved in the sale. The sale price is not aggregated for all parcels since the sale price listed on the deed is already the total sale price for all parcels involved in the sale. Once the values have been combined or aggregated, the parcels not tagged as the primary parcel are removed from the analysis, leaving only the primary parcel in the sample to

be used in the analysis. Conflicts occur when the primary parcel of a multi-parcel sale is not coded 'VA'. In some instances when a county is working the deed of a multi-parcel, the first parcel that they determine is part of the multi-parcel sale is coded as 'VA' and then all additional parcels are coded 'AP', even though the first parcel may have been vacant and one of the additional parcels was improved. In this case the improved parcel should have been coded 'VA' and the vacant parcel should have been coded 'AP'. So when this multi-parcel sale is analyzed in SPSS, we will be left with a vacant parcel that contains improved values.

- For invalid sales, if a multi-parcel sale is determined to be an invalid sale, then the same invalid "sales validation code" should be coded on all parcels involved in the multi-parcel sale. In some instances, only one parcel of the multi-parcel sale was coded with the proper invalid sales validation code, while the sales validation code on the remaining parcels of the multi-parcel sale was either left blank or coded with the 'UV' (unverified) code. 'UV' codes remain in the analysis, in the above example, some of these parcels that were determined to be invalid could end up being part of the analysis and distorting the overall results of the ratio study.

Rule 4.04.1b directs counties to supply ACD with a list of all deeds for the time frame covered in the ratio study. However, there are no official definitions of deed type codes and counties declare and define these individually. Submitted deed type codes are numerous and sometimes missing, making it difficult to determine whether sales are in fact warranty or special warranty deeds. For example, "CP" represents corporate warranty deeds in some counties and contract for purchase sales in others.

While ACD rules provide a list of allowable rejection codes for invalidating sales to be considered in the study, submitted validation codes very often deviated from defined approved codes, were simply marked "UV" (unverified), or left blank. Attachment 2 shows the percentage of sales assigned valid and invalid verification codes in each county, as well as the percentage coded "UV" or (less frequently) left blank. The percentage of sales affirmatively assigned valid sales codes (VS, VA, or AP) ranges from 3% to 31%, while the percentage of sales affirmatively assigned invalid sales codes ranges from 14% to 90%. Overall, 37% of sales were assigned "UV" or blank codes, with the percentage ranging from 4% to 55%. While a low percentage of usable sales can be partly explained by the fact that many unusable sales are likely other than warranty or special warranty deeds, the wide ranges indicates considerable diversity in the way sales are coded in each county.

There is nothing in ACD rules to condone the automatic elimination of "UV" or blank sales and IAAO standards call for retaining sales unless there is a specific reason for rejecting the sale. In any case, this year's study considers only sales that appear to be warranty or special warranty deeds. It retains UV validation codes, which are subject to special outlier analysis as explained previously. However, validation codes not defined in ACD rules were recoded as unverified sales (UV) and used in the study. All verified (VA, VS, AP) and unverified (UV) sales were subject to routine outlier analysis.

Blank sale prices were very common in all counties. These reflected deeds that were filed with no revenue stamps. These sales were removed from the study. During the Sales Validation Audit a sample of these “zero sale price” deeds were audited to determine if any did in fact have revenue stamps attached to the deed or had an affidavit attached to the deed listing the sale price of the property. In six of the nineteen counties (or 33%), there were deeds containing revenue stamps or affidavits listing the sale price that had been coded with a zero sale price (the error rate in those counties ranged from 5% to 40%). These zero sale price deeds will be scrutinized much more closely in the future based on these error rates. These are quite possibly sales that should have been used by the counties or contractors in their analysis, as well as being used in the ratio study.

Every county had a small number of duplicate sold parcels that had the same deed references with the exception of differences in the grantee and/or grantor. The duplicate parcels were removed from the study. It appears in most of the instances the counties are inserting additional transfer records for the same deeds to correct or modify the grantee and/or grantor. This should not be occurring, notes should be added to the comment section of the deed’s transfer record.

ATTACHMENT 1
2015 Ratio Study
Summary of County Results

County	Property Class	Years	Sales	Median	LCL	UCL	COD	Time Trend	Solds vs Unsolds
Bradley	Residential	2	89	19.33	18.65	20.43	15.00	None	Pass
	Commercial	3	14	21.17	18.40	23.46	14.70	None	Pass
	Vacant	2	21	20.00	18.00	20.06	12.30	None	Pass
Calhoun	Residential	2	27	20.07	18.96	20.63	5.50	None	Pass
	Commercial	3	7	21.04	19.52	21.43	2.80	None	Pass
	Vacant	2	5	19.37	11.39	20.23	10.40	None	Pass
Clark	Residential	2	212	19.63	19.05	20.17	11.80	None	Pass
	Commercial	3	32	20.98	19.01	22.84	17.20	None	Pass
	Vacant	2	43	20.00	19.55	20.64	12.00	None	Pass
Crittenden	Residential	2	527	19.65	19.52	19.81	6.90	None	Pass
	Commercial	3	20	19.73	19.03	20.11	5.30	None	Pass
	Vacant	2	94	20.00	20.00	20.00	6.90	None	Pass
Cross	Residential	2	213	18.41	18.01	18.94	13.10	Yes	Pass
	Commercial	3	15	20.74	18.79	25.34	15.10	None	Pass
	Vacant	2	45	18.75	18.20	19.33	11.00	None	Pass
Independence	Residential	2	458	19.32	19.06	19.63	10.20	None	Pass
	Commercial	3	34	20.36	17.95	21.44	19.00	None	Pass
	Vacant	2	119	20.40	19.41	19.90	14.60	None	Pass
Johnson	Residential	2	270	19.93	19.48	20.18	12.90	None	Pass
	Commercial	3	21	20.52	18.84	24.31	17.50	None	Pass
	Vacant	2	73	20.00	18.86	20.00	15.70	None	Pass
Lincoln	Residential	2	64	19.53	18.95	20.69	19.60	None	Pass
	Commercial	3	5	21.02	16.68	25.68	13.30	None	Pass
	Vacant	2	20	19.63	16.75	24.44	28.40 ⁽¹⁾	None	Pass
Logan	Residential	2	148	19.70	19.32	20.37	13.70	None	Pass
	Commercial	3	10	19.51	16.25	28.83	16.00	None	Pass
	Vacant	2	48	20.00	19.32	20.08	21.50	None	Pass
Miller	Residential	2	487	19.79	19.46	20.14	11.90	None	Pass
	Commercial	3	28	20.16	18.62	21.49	15.00	None	Pass
	Vacant	2	99	20.00	20.00	20.00	7.00	None	Pass
Monroe	Residential	2	34	19.66	19.31	20.46	6.60	None	Pass
	Commercial	3	7	20.14	18.70	21.84	3.70	None	Pass
	Vacant	2	16	19.67	18.30	20.22	6.40	None	Pass

ATTACHMENT 1
2015 Ratio Study
Summary of County Results

County	Property Class	Years	Sales	Median	LCL	UCL	COD	Time Trend	Solds vs Unsolds
Ouachita	Residential	2	250	18.78	18.39	19.43	13.30	None	Pass
	Commercial	3	19	20.38	19.66	22.61	10.70	None	Pass
	Vacant	2	39	20.00	18.00	20.00	17.50	None	Pass
Prairie	Residential	2	48	19.01	17.91	19.89	15.90	None	Pass
	Commercial	3	11	20.31	13.26	28.60	27.70 ⁽²⁾	None	Pass
	Vacant	2	15	19.40	18.50	20.11	12.90	None	Pass
Sebastian	Residential	1	990	19.97	19.84	20.15	8.50	None	Pass
	Commercial	2	83	19.88	19.33	20.49	13.60	None	Pass
	Vacant	1	113	20.00	19.52	20.00	12.90	None	Pass
Sevier	Residential	2	159	19.61	18.97	20.04	12.40	None	Pass
	Commercial	3	17	21.66	18.99	24.77	17.50	None	Pass
	Vacant	2	27	20.00	17.14	20.00	11.20	None	Pass
Sharp	Residential	2	291	19.78	19.31	20.45	15.20	None	Pass
	Commercial	3	24	21.54	20.17	22.84	11.50	None	Pass
	Vacant	2	167	18.35	17.76	19.22	21.00	Yes	Pass
Van Buren	Residential	2	244	19.33	18.84	19.82	13.50	Yes	Pass
	Commercial	3	13	21.18	16.12	26.98	19.90	None	Pass
	Vacant	2	45	19.05	18.18	21.60	19.00	None	Pass
Washington	Residential	1	2323	19.23	19.14	19.30	8.00	Yes	Pass
	Commercial	2	212	19.65	19.16	20.13	14.30	Yes	Pass
	Vacant	1	430	20.00	19.76	20.00	14.40	None	Pass
Woodruff	Residential	2	61	18.68	18.20	20.12	20.70 ⁽³⁾	None	Pass
	Commercial	3	6	18.73	16.50	26.91	12.60	None	Pass
	Vacant	2	21	19.32	18.83	20.00	8.70	None	Pass

(1) - Lincoln County - Although the vacant land COD of 28.40 exceeds the standard of 25.00 for vacant land properties in counties with less than 50,000 parcels; it is below the critical value of 31.49 required to conclude non-compliance at the 95% confidence level for a sample containing (20) sales.

(2) - Prairie County - Although the commercial improved COD of 27.70 exceeds the standard of 25.00 for commercial improved properties in counties with less than 50,000 parcels; it is below the critical value of 33.83 required to conclude non-compliance at the 95% confidence level for a sample containing (11) sales.

(3) - Woodruff County - Although the residential improved COD of 20.70 exceeds the standard of 20.00 for residential improved properties in counties with less than 50,000 parcels; it is below the critical value of 22.96 required to conclude non-compliance at the 95% confidence level for a sample containing (61) sales.

ATTACHMENT 2

2015 Ratio Study

Distribution of Validation Codes

County	Sales Considered	% Valid Usable Codes	% Valid Rejection Codes	% Undefined Codes	% Unverified Codes	Undefined Codes
Bradley	1,377	5.95%	56.35%	0.00%	37.69%	
Calhoun	793	6.31%	90.04%	0.00%	3.66%	
Clark	1,881	24.08%	28.02%	7.12%	40.78%	OT, QS
Crittenden	3,317	21.80%	69.61%	0.00%	8.59%	
Cross	1,851	27.66%	60.78%	6.05%	5.51%	OT
Independence	4,807	17.43%	31.47%	0.46%	50.63%	AG, AV, DV, IS, NM, OT, RE
Johnson	2,217	4.15%	45.06%	4.87%	45.92%	NP
Lincoln	1,276	23.20%	52.43%	4.39%	19.98%	AG, AI, av, AV, DV, IS, L, NM, OT, QC, QS, RC
Logan	2,447	4.62%	53.70%	6.05%	35.64%	27, IS, NM, NS, OT
Miller	4,280	20.05%	69.67%	0.00%	10.28%	
Monroe	936	2.99%	50.21%	22.54%	24.25%	NM, NS
Ouachita	2,528	5.26%	43.83%	0.08%	50.83%	RC
Prairie	1,227	11.49%	43.68%	1.55%	43.28%	AI, FC, FM, IS, LF
Sebastian	9,882	23.56%	34.49%	5.57%	36.39%	AI, BS, DD, DE, DV, IS, NM, NS, OT, RC, SB, SS, ST, TS, TT
Sevier	1,401	11.99%	50.32%	1.86%	35.83%	OT, RK
Sharp	8,405	6.14%	82.08%	0.02%	11.75%	24
Van Buren	2,858	3.15%	72.81%	0.00%	24.04%	
Washington	24,120	30.85%	13.57%	0.80%	54.78%	BT, DV, IS, LT, NM, OT, RC, ZZ
Woodruff	1,208	17.14%	41.39%	0.00%	41.47%	
Totals	76,811	19.62%	41.54%	2.06%	36.78%	

Valid Sale Usable Codes:

AP, VA, VS

Valid Sale Rejection Codes:

AL, AS, CH, CS, CT, CV, DT, ES, FD, FI, FS, GO, MH, MU, OF, PI, PP, RL, TR

Undefined Validation Codes:

24, 27, AG, AI, av, AV, BS, BT, DD, DE, DV, FC, FM, IS, L, LF, LT, NM, NP, NS, OT, QC, QS, RC, RE, RK, SB, SS, ST, TS, TT

Unverified Sale Codes:

UV or blank